

$$(b) \quad y(t) = \frac{d}{dt} e^{-(t-t_0)}$$

System is causal as it depends on present & past value of input. Therefore it has memory also.
(Differentiation include past values of the signals)

$$x_1(t) = x(t-t_0)$$

$$y_1(t) = \frac{d}{dt} e^{-t} x(t-t_0)$$

$$\begin{aligned} y(t-t_0) &= \frac{d}{dt} e^{-(t-t_0)} x(t-t_0) \\ &= e^{t_0} \frac{d}{dt} \left\{ e^{-t} x(t-t_0) \right\} \end{aligned}$$

$$y_1(t) \neq y(t-t_0)$$

\therefore No time invariant

Q.2 a) $x_1(t) = u(t+2) - 2u(t) + u(t-1)$

